The Houston Air Quality Challenge

Addressing air quality in the Houston region is a highly complex undertaking because of the climate, a large urban population, and a massive industrial complex. The TCEQ has mustered a variety of control strategies and initiatives to tackle emissions on many fronts.

Rapid economic and population growth create a potent blend for the region's environment

In this story:

The air quality in Houston is monitored more closely and analyzed with more intensity than perhaps anywhere in the country--possibly the world.

That's because the factors contributing to the region's ozone and air toxics problems are numerous and complicated. As the 4.7 million people living and working in the metropolitan statistical area know, Houston is sunny and hot for much of the year.

The factors of climate and a large, sprawling urban population are enough to bring air quality issues to a simmer. Stir in one of the largest industrial complexes in the world, and the kettle boils over with contributing sources of air pollution.

Addressing these conditions gets more complicated thanks to a complex meteorology influenced by an ever-changing land-and-sea breeze driven by the Gulf of Mexico.

The region's air quality is monitored daily--even hourly--by a total of 141 air pollution monitors and sampler instruments owned by the TCEQ, private industry, and local governments. These monitors screen for 138 chemical compounds, including ozone precursors and toxic air pollutants.

Even with all of its challenges, the Houston region has made significant improvements in air quality over the last two decades. The TCEQ commissioners have adopted a plan that demonstrates attainment with the federal 1-hour ozone standard in 2007.

Ground-level ozone, a component of smog, is formed when pollutants emitted by cars, power plants, refineries, chemical plants, trees, and other sources react chemically in sunlight. Nitrogen oxides (NO_x) and volatile organic compounds are the leading ozone precursors.

Yet a deadline of 2010 looms for reaching compliance with the 8-hour standard, as established by the Environmental Protection Agency.

The TCEQ has developed a host of strategies for addressing the wide range of sources contributing to air pollution in Houston and the surrounding area. More recently, the agency has fine-tuned its approach and ramped up enforcement efforts.

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Initiatives Unfold

The state strategy for improving air quality--a blueprint called the State Implementation Plan (SIP)--contains a number of programs designed to deal with the complexities of the Houston region.

"The State Implementation Plan was crafted using cutting-edge science," said TCEQ Chairman Kathleen Hartnett White. "The programs designed for the Houston area are supported by the most robust modeling ever performed for an attainment demonstration, using improved meteorological and pollutant measurements, chemistry data, and findings from in-depth scientific studies."

For several years, the SIP concentrated primarily on finding ways to lower nitrogen oxide (NOx) emissions, said White. But with better information, continued analysis, and the advent of more sophisticated monitoring tools, the emphasis has shifted to highly reactive volatile organic compounds (HRVOCs), she said.

Studies indicate that HRVOC emissions, which are prevalent along the industrialized Texas coastline, contribute to the rapid formation of ozone. In Houston, the four compounds of interest are 1,3-butadiene, ethylene, propylene, and the butenes. As a result, the most recent control strategies detailed in the SIP are a combination of point source HRVOC and NOx reductions.

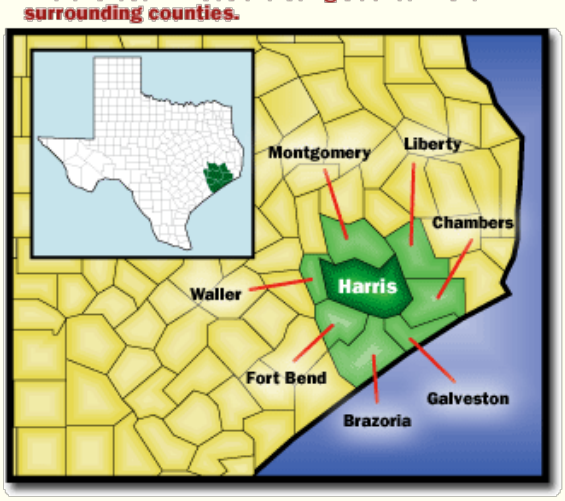
This year, the TCEQ embarked on two new enforcement initiatives, both designed to reduce the emissions of HRVOCs and NOx. The agency is concentrating its resources around the Houston Ship Channel to search for industrial operations that do not have the proper emissions authorizations and for operations that have authorization but are not in compliance with those requirements.

With the HRVOC High Emitters Initiative, TCEQ investigators in February began examining 28 industrial plants that reported unauthorized HRVOC emission events last year of 1,200 pounds or more. At these on-site compliance investigations, the TCEQ also has looked closely at "fugitive" emissions--a multitude of equipment leaks, many of which are too small to be detected individually.

The agency, with assistance from the Houston Bureau of Air Quality Control, is reviewing overall compliance with state and federal air regulations, and determining whether adequate safeguards are in place to minimize future HRVOC emissions.

Monitoring for HRVOCs

In Harris County, the TCEQ is monitoring for four highly reactive volatile organic compounds, which are thought to contribute to rapid ozone formation. Two of those HRVOCs are being tracked in the surrounding counties.



In the Diesel Engine Initiative, the TCEQ has focused on large stationary diesel engines that are plentiful along the ship channel, performing duties such as driving the cranes that unload ships and providing emergency electrical power generation. This initiative is so labor-intensive that the TCEQ has called on many of its other field offices to assist the Houston Region 12 Office.

The TCEQ commissioners also have revised the rules designed to obtain reductions in both short-term and annual HRVOC emissions from four key industrial sources: fugitive emissions, flares, process vents, and cooling towers.

Beginning on Dec. 31, 2005, the agency will require Houston-area facilities to monitor or test equipment having the potential to emit HRVOCs. The rules also create a cap on annual emissions from the key industrial sources, requiring companies to reduce their routine HRVOC emissions, and an hourly do-not-exceed limit to curb the magnitude of releases.

By January 2007, Harris County companies must be in compliance with the HRVOC cap-and-trade program, which limits HRVOC emissions on an area-wide basis. Sites that stay under the cap may sell their excess allowances to other sites in the area. This allows reductions to occur in the most cost-effective manner.

In Harris County, these rules apply to the four HRVOC compounds; of these, only ethylene and propylene emissions are affected in the counties of Brazoria, Chambers, Fort Bend, Galveston, Liberty, Montgomery, and Waller.

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Mobile Monitoring

In early 2005, the TCEQ stepped up its mobile monitoring of specific industrial facilities in southeast Houston.

With mobile monitoring, the agency places vans equipped with air monitoring equipment immediately upwind and downwind of facilities to determine potential sources of air contaminants. These vans also go into residential areas to measure communities' exposure to 1,3-butadiene and other toxic air pollutants.

The Houston regional office has been on call 24 hours a day to conduct investigations when mobile monitoring detects elevated concentrations.

Investigators from the agency's Houston regional office and other field operations staff have attempted to correlate elevated concentrations of emissions to specific sources.

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Health Concerns

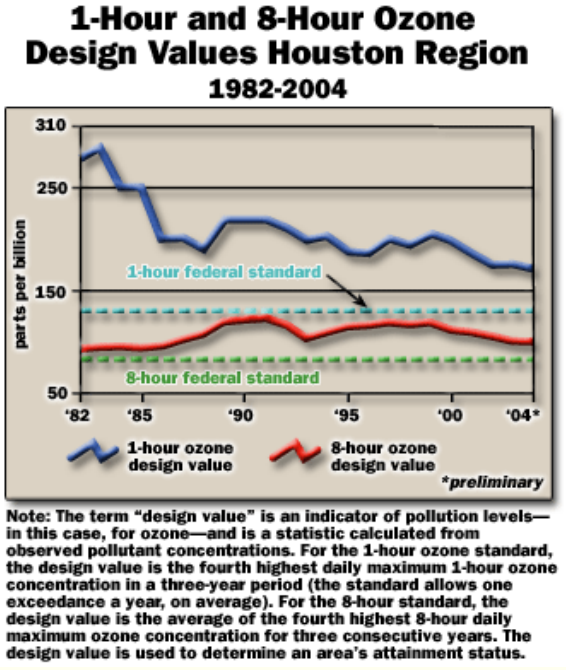
State and local air monitoring equipment in the Houston area provides valuable information on air toxics, as well as the formation and movement of ozone, but these monitoring results are not designed to be a risk assessment of individual health concerns. Rather, the data show state and local officials where potential health risks might be

higher as a consequence of long-term exposure to emissions.

During the TCEQ's most recent evaluation in 2003, there were 109 chemicals reviewed. Of those, three were shown to exceed the state's health-effects screening levels. Agency toxicologists have determined that these measurements are not an immediate health threat. Texas has the most comprehensive health-based guideline levels in the country. The TCEQ is in the process of updating the methods for deriving those levels, and a peer review is under way by an independent contractor.

Houston residents living near industrial facilities along the ship channel have voiced concerns about the consequences of long-term exposure.

In recent months, the TCEQ has conducted 14 public information sessions to explain the findings from the agency's 2003 air monitoring report and to take questions from residents of east Houston neighborhoods.



Note: The term "design value" is an indicator of pollution levels—in this case, for ozone—and is a statistic calculated from observed pollutant concentrations. For the 1-hour ozone standard, the design value is the fourth highest daily maximum 1-hour ozone concentration in a three-year period (the standard allows one exceedance a year, on average). For the 8-hour standard, the design value is the average of the fourth highest 8-hour daily maximum ozone concentration for three consecutive years. The design value is used to determine an area's attainment status.

"We are attempting to respond to the public with information based on science," said Michael Honeycutt, manager of the TCEQ toxicology section. "Many of the questions we get are about increased cancer risks. We tell people that when cancer is found in a community, it's impossible to isolate what, if any, role a nearby chemical plant may have played. That's because cancer is a disease with many different causes, including lifestyle choices."

Honeycutt said no studies have shown evidence of elevated levels of cancer or specific types of respiratory disease in Houston, compared to other areas of Texas or the United States. Cancer cluster studies conducted by the state health department did not find elevated cancer rates in east Houston, he added.

Honeycutt said the TCEQ is continuing to work with state health officials to help identify any potential health risks or patterns.

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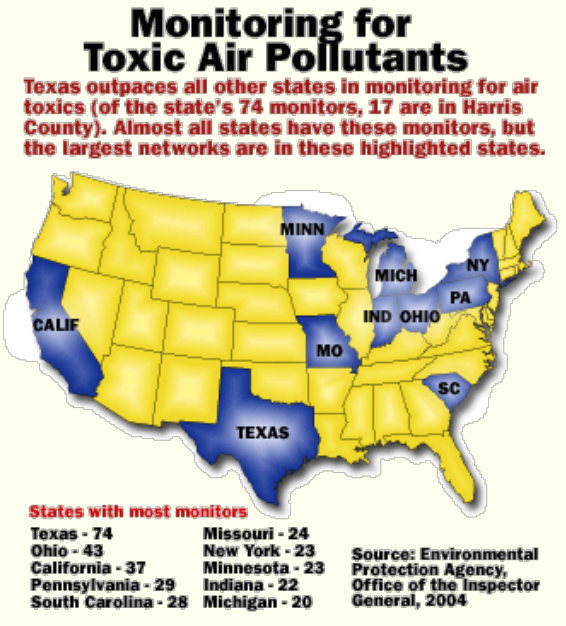
Other Initiatives Take Shape

In a quest to detect pollution as it occurs, the TCEQ has experimented with infrared technology developed by the military. In February, state and local investigators tried out an infrared leak survey camera that visually detects escaping hydrocarbon vapors and captures the emissions on video. The camera was used in Houston during visits to industrial facilities. In one visit, a sizeable hydrocarbon leak was discovered at a flange on a heat exchanger, equipment that company representatives said they thought was out of service.

The TCEQ will evaluate the infrared technology and determine how it could be used in future investigations.

The agency also wants to expand its monitoring network in Houston to detect ozone precursors and air toxics. Doing so would cost about $3.2 million, in addition to $750,000 in annual operating costs, if approved by the Legislature.



The TCEQ already has used its existing network to conduct a pilot project of the Environmental Monitoring and Response System for near real-time air monitoring of emissions along the ship channel (see "On the Track of Air Pollution"). A second phase of the project, operating on a broader scale, will begin this summer.

Also, the TCEQ has formed a stakeholder group to explore improvements to the inventory of volatile organic compound emissions. Improving the reliability and completeness of inventory data would help the agency determine which emissions should be the focus of future control strategies. After the 2000 Texas Air Quality Study of Southeast Texas, analysis indicated a discrepancy between the reported emissions inventory data and the concentrations of air

contaminants measured during the study.

The next air quality study, which will focus on all of East Texas, gets under way in May and continues until October 2006. As in 2000, the comprehensive research project will include experts from universities; agencies at the state, federal, and local levels; private industry; and environmental organizations.

"The first step in reducing air pollution is to understand its causes, how it is formed, and how it travels," said White. "This study will look at a larger area over a longer time. We expect even greater participation by researchers from around the country in this important scientific endeavor."

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Diesel Rule Change

The TCEQ has extended the compliance date for the low-emission diesel-fuel standards. The Texas Low Emission Diesel rule applies to diesel fuel producers, importers, common carriers, distributors, transporters, bulk terminal operators, and retailers. Diesel fuel produced for delivery and ultimate sale--for both onroad and nonroad use in 110 East Texas counties--must contain less than 10 percent by volume of aromatic hydrocarbons and have a cetane number of 48 or greater. Alternatives for compliance with these specifications are allowed.

The goal is to lower the emissions of nitrogen oxides (NOx) and other pollutants from diesel-powered motor vehicles and nonroad equipment. The affected area includes the ozone nonattainment areas of Houston-Galveston-Brazoria, Dallas-Fort Worth, and Beaumont-Port Arthur.

The agency extended compliance from April 1, 2005, to Oct. 1, 2005, for producers and importers. Compliance is required for bulk plant distribution facilities beginning Nov. 15, 2005, and for retail fuel-dispensing outlets, wholesale bulk purchasers, and consumer facilities beginning Jan. 1, 2006.

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